

Study program: Mechanical engineering			
Type and level of studies: Doctoral studies			
Course unit: Dynamic Problems of Railway Vehicles			
Teacher in charge: prof. dr. Dragan Petrović			
Language of instruction: English			
ECTS: 5			
Prerequisites: Higher level of knowledge of mathematics and mechanics.			
Semester: Spring			
Course unit objective:			
Gaining of higher level of knowledge in the field of rail vehicle dynamics.			
Learning outcomes of the course unit:			
Training for solving the problems in the field of calculation and analysis of the dynamic behaviour of railway vehicles and their structural parts.			
Course unit contents			
<i>Theoretical classes</i>			
Introductory remarks. Railway track and its characteristics. Classification and characteristics of railway vehicles. Main structural parts of railway vehicles and their characteristics. Vehicle-track interaction. Modelling and dynamic analysis of railway vehicles. Advanced techniques of modelling of railway vehicles. Wheel-rail interaction. Guidance of wheelset in the track. Equivalent conicity. Klingel equation. Running on the tangent track. Running in the curve. Friction forces in the wheel-rail interaction. Contact theory of Kalker. Dynamic stability of railway vehicle of the track. Wheel-rail contact forces and derailment. Vehicle turnover. Aerodynamic influences on the vehicle. Railway vehicles impact. Wheel-rail wear. Quiet running and running stability of railway vehicle. Railway vehicles gauging. Dynamic calculations in the design of railway vehicles. Experimental methods of testing of rail vehicle dynamics.			
<i>Practical classes</i>			
Examples of dynamic problems of railway vehicles.			
Literature			
E. Andersson, M. Berg, S. Stichel, Rail Vehicle Dynamics, Railway Group KTH, Stockholm, 2007.			
S.D. Iwnicki, Handbook of Railway Vehicle Dynamics, CRC Press, Taylor & Francis Group, Boca Raton, 2006.			
Number of active teaching hours			Other classes
Lectures: 3	Practice:	Other forms of classes:	
Independent work:			
Teaching methods			
Theoretical classes. Introducing with the examples of dynamic problems of railway vehicles and ways of solving them. Seminar on a given topic.			
Examination methods (maximum 100 points)			
Exam prerequisites	No. of points:	Final exam	No. of points:
Student's activity during lectures		oral examination	50
practical classes/tests		written examination	
Seminars/homework	50		
Project			
Other			
Grading system			
Grade	No. of points	Description	
10	91-100	Excellent	
9	81-90	Exceptionally good	
8	71-80	Very good	
7	61-70	Good	
6	51-60	Passing	
5	Less than 50	Failing	